

CLAIMS

1 1.(withdrawn) A composition comprising a modified nucleotide including a molecular and/or
2 atomic tag, where the nucleotide alters base incorporation fidelity in a nucleotide polymerizing agent
3 relative to a base incorporation fidelity of the agent in the absence of the modified nucleotide.

1 2.(withdrawn) The composition of claim 1, wherein the modified nucleotide comprises a β
2 and/or γ phosphate modified nucleotide.

1 3.(withdrawn) The composition of claim 1, wherein the modified nucleotide comprises a β
2 phosphate modified nucleotide.

1 4.(withdrawn) The composition of claim 1, wherein the modified nucleotide comprises a γ
2 phosphate modified nucleotide.

1 5.(withdrawn) The composition of claim 4, wherein the tag comprises a molecule.

1 6.(withdrawn) The composition of claim 5, wherein the tag is ANS.

1 7.(currently amended) A method for using modified nucleotides to alter base incorporation
2 fidelity comprising the step of adding a modified nucleotide including a molecular and/or atomic tag
3 to a nucleotide polymerization medium comprising a nucleotide polymerizing agent, a primer and
4 a template, where the modified nucleotide alters base incorporation fidelity of a the nucleotide
5 polymerizing agent relative to a base incorporation fidelity of the nucleotide polymerizing agent in
6 the absence of the modified nucleotide.

1 8.(original) The method of claim 7, wherein the modified nucleotide comprises a β and/or γ
2 phosphate modified nucleotide.

1 9.(original) The method of claim 7, wherein the modified nucleotide comprises a β phosphate
2 modified nucleotide.

1 10.(original) The method of claim 7, wherein the modified nucleotide comprises a γ phosphate
2 modified nucleotide.

1 11.(canceled) The method of claim 10, wherein the tag comprises a molecular tag.

1 12.(currently amended) The method of claim ~~10~~, wherein the tag comprises
2 aminonaphthalene-1-sulfonate (ANS).

1 13.(currently amended) A method for using modified nucleotides to alter base incorporation
2 fidelity comprising the step of adding a modified nucleotide including a molecular ~~and/or atomic~~ tag
3 to an assay for extending a nucleotide sequence, where the modified nucleotide alters base
4 incorporation fidelity of a nucleotide polymerizing agent relative to a base incorporation fidelity of
5 the polymerizing agent in the absence of the modified nucleotide, and the assay is selected from the
6 group consisting of genotyping for *in vitro* reproductive methods (human and other organisms);
7 single nucleotide polymorphism (SNP) detection; DNA sequencing; RNA sequencing; single
8 nucleotide extension assays; amplified DNA product assays; rolling circle product assays; PCR
9 product assays; allele-specific primer extension assays; single-molecule arrays (DNA, RNA, protein)
10 assays; and drug toxicity evaluation assays.

1 14.(withdrawn) A method for making blunt-ended fragments comprising the steps of
2 amplifying a DNA fragment in the presence of a nucleotide including a molecular and/or atomic tag
3 on a γ phosphate group and/or a base moiety, where the tag alters fidelity of base incorporation and
4 decreases or eliminates non-templated addition of a base to the 3' end of the DNA fragment being
5 amplified.

1 15.(currently amended) A kit for performing a nucleotide polymerizing reaction comprising
2 polymerizing reagents and using at least one modified nucleotide including ~~an atomic and/or a~~
3 molecular tag in the presence of a polymerizing agent, a primer and a template, where the modified
4 nucleotide alters polymerizing agent extension fidelity for the at least one modified nucleotide
5 compared to the polymerizing agent extension fidelity in the unmodified nucleotide corresponding
6 to the at least one modified nucleotide.

1 16.(withdrawn) A method of inhibiting or preventing pyrophosphorolysis during synthesis of
2 a nucleic acid molecule, said method comprising

3 (a) combining a primer with a nucleic acid template under conditions sufficient to form a hybridized
4 product; and

5 (b) incubating the hybridized product with a polymerase in the presence or absence of an enzyme
6 selected from the group consisting of a pentosyltransferase, a phosphotransferase with alcohol group
7 as acceptor, a nucleotidyltransferase, and a carboxy-lyase, under conditions sufficient to form a
8 second nucleic acid molecule complementary to all or a portion of the nucleic acid template,

9 where a tagged nucleotide comprises an atomic and/or molecular tag or moiety attached to
10 and/or associated with a β and/or γ -phosphate and/or a base moiety of the nucleotide is added at
11 either or both steps to inhibit or prevent pyrophosphorolysis during synthesis of a nucleic acid
12 molecule.

1 17.(withdrawn) A composition comprising a nucleotide including a molecular and/or atomic
2 tag on a phosphate group adapted to alter the fidelity of viral replication.

1 18.(withdrawn) The composition of claim 17, wherein the virus is HIV.

1 19.(withdrawn) A method for increasing the fidelity of replication comprising administering
2 an therapeutically effective amount of a nucleotide including a molecular and/or atomic tag on a γ
3 phosphate group to an animal including a human, where the nucleotide is designed to increase base
4 incorporation fidelity during replication.

1 20.(withdrawn) The method of claim 19, wherein the replication is caused by an HIV virus.

1 21.(currently amended) The method of claim 7, wherein the tag ~~comprises a molecular tag is~~
2 covalently bonded to the modified nucleotide through a linker.

1 22.(currently amended) The method of claim 7, wherein the tag ~~comprises a molecular tag is~~
2 covalently bonded to the modified nucleotide.

1 23.(currently amended) The method of claim ~~11~~¹⁰, wherein the molecular tag comprises a
2 fluorophore selected from the group consisting of 4-acetamido-4'isothiocyanatostilbene-
3 2,2'disulfonic acid; acridine and derivatives: acridine, acridine isothiocyanate; 5- (2'-aminoethyl)
4 aminonaphthalene-1-sulfonic acid (EDANS); 4-amino-3-vinylsulfonyl phenyl] naphthalimide-3,5
5 disulfonate; - (4-anilino-1naphthyl) maleimide; anthranilamide; BODIPY; Brilliant Yellow;
6 coumarin and derivatives: coumarin, 7-amino-4-methylcoumarin (AMC, Coumarin 120), 7-amino-
7 4trifluoromethylcouluarin (Coumaran 151); cyanine dyes; cyanoine; 4', 6-diaminidino-
8 2phenylindole (DAPI); 5', 5"-dibromopyrogallol-sulfonaphthalein (Bromopyrogallol Red); 7-
9 diethylamino-3- (4'-isothiocyanatophenyl)-4-methylcoumarin; diethylenetriamine pentaacetate; 4,4'-
10 diisothiocyanatodihydro-stilbene-2,2'-disulfonic acid; 4,4' diisothiocyanatostilbene-2,2'-disulfonic
11 acid; 5-dimethylamino naphthalene-1-sulfonyl chloride (DNS, dansylchloride); 4-
12 dimethylaminophenylazophenyl-4'-isothiocyanate (DABITC); eosin and derivatives: eosin, eosin
13 isothiocyanate, erythrosin and derivatives: erythrosin B, erythrosin, isothiocyanate; ethidium;
14 fluorescein and derivatives: 5carboxyfluorescein (FAM), 5- (4, 6-dichlorotriazin-2-yl)
15 aminofluorescein (DTAF), 2', 7'dimethoxy-4'5'-dichloro-6-carboxyfluorescein (JOE), fluorescein,
16 fluorescein isothiocyanate, QFITC, (XRITC); fluorescamine; IR144; IR1446; Malachite Green
17 isothiocyanate; 4-methylumbelliferoneortho cresolphthalein; nitrotyrosine; pararosaniline; Phenol
18 Red; B-phycoerythrin; o-phthaldialdehyde; pyrene and derivatives: pyrene, pyrene butyrate,
19 succinimidyl 1-pyrene; butyrate quantum dots; Reactive Red 4 (CibacronTM Brilliant Red 3B-A)
20 rhodamine and derivatives: 6-carboxy-X-rhodamine (ROX), 6carboxyrhodamine (R6G), lissamine
21 rhodamine B sulfonyl chloride rhodamine (Rhod), rhodamine B, rhodamine 123, rhodamine X
22 isothiocyanate, sulforhodamine B, sulforhodamine 101, sulfonyl chloride derivative of
23 sulforhodamine 101 (Texas Red); N, N, N', N'-tetramethyl-6-carboxyrhodamine (TAMRA);
24 tetramethyl rhodamine; tetramethyl rhodamine isothiocyanate (TRITC); riboflavin; rosolic acid;
25 terbium chelate derivatives; Cy 3; Cy 5; Cy 5.5; Cy 7; IRD 700; IRD 800; La Jolla Blue; phthalo
26 cyanine; and naphthalo cyanine.

1 24.(currently amended) The method of claim ~~11~~¹⁰, wherein the molecular tag is selected from
2 the group consisting of alkyl groups having between 1 and 30 carbon atoms, aryl groups having
3 between about 6 and about 40 carbon atoms, or alkaryl and aralkyl groups having between about 7

4 and about 40 carbon atoms, or mixture or combinations thereof, where the carbon atoms are replace
5 by one or more hetero atoms in the structure provided the structure represents a stable molecular
6 system, where the hetero atoms selected from the group consisting of P, S, Si, N, and O.

1 25.(currently amended) The method of claim ~~11~~¹⁰, wherein the molecular tag is selected from
2 the group consisting of 4-aminophenol, 6-aminonaphthol, 4-nitrophenol, 6-nitronaphthol, 4-
3 methylphenol, 6-chloronaphthol, 4-methoxyphenol, 6-bromonaphthol, 4-chlorophenol, 6-
4 iodonaphthol, 4-bromophenol, 4, 4'-dihydroxybiphenyl, 4-iodophenol, 8-hydroxyquinoline, 4-
5 nitronaphthol, 3-hydroxypyridine, 4-aminonaphthol, umbelliferone, 4-methylnaphthol, resorufin, 4-
6 methoxynaphthol, 8-hydroxypyrene, 4-chloronaphthol, 9-hydroxyanthracene, 4-bromonaphthol, 6-
7 nitro-9-hydroxyanthracene, 4-iodonaphthol, 3-hydroxyflavone, 6-methylnaphthol, fluorescein, 6-
8 methoxynaphthol, 3-hydroxybenzoflavone, 1-hydroxy-2-propyne, 1-hydroxy-4-pentyne, 1-hydroxy-
9 3-butyne, 1-hydroxy-5-hexyne, Methanol, Ethanol, Propanol, Isopropanol, Butanol, Tert-butanol,
10 Hexanol, Cyclohexanol, Heptanol, Octanol, Decanol, Undecanol, Dodecanol, 1-acetoxyethanol
11 (CH₃0OCCH₂-O-NTP), 2-acetoxyethanol, 3-acetoxypropanol, 4-acetoxybutanol, 5-acetoxypentanol,
12 6-acetoxyhexanol, 2-nitroethanol, 3-nitropropanol, 4-nitrobutanol, 5-nitropentanol, 5-nitrohexanol,
13 1-hydroxy-3-propene, 1-hydroxy-2-cyclohexene, 1-hydroxy-4-butene, 1-hydroxy-3-propaldehyde,
14 1-hydroxy-5-pentene, 1-hydroxy-4-butanaldehyde, 1-hydroxy-6-hexene, 1-hydroxy-3-Butanone,
15 Phenol, 4-methyl-3-hydroxypyridine, 4-Carboxyphenol, 5-methoxy-3-hydroxypyridine, 4-
16 Acetoxyethylphenol, 5-nitro-3-hydroxypyridine, 4-nitrophenol, 5-acetoxyethyl-3-
17 hydroxypyridine, 4-methylphenol, 6-methyl-8-hydroxyquinoline, 4-methoxyphenol 6-methoxy-8-
18 hydroxyquinoline, 4-ethylphenol, 4-methyl-8-hydroxyquinoline, 4-butylphenol, 6-nitro-8-
19 hydroxyquinoline, naphthol, 4-acetoxyethyl-8-hydroxyquinoline, 4 or 6 or 8 methylnaphthol
20 pyrene, 4 or 6 or 8 methoxynaphthol, 6-methyl-8-hydroxypyrene, 4 or 6 or 8 nitronaphthol, 6-ethyl-
21 8-hydroxypyrene, 4 or 6 or 8 ethylnaphthol, 6-nitro-8-hydroxypyrene, 4 or 6 or 8 butylnaphthol 6-
22 (carboxysuccinimidylester) fluorescein, 4 or 6 or 8 acetoxyethylnaphthol, 6-carboxymethyl-2, 7-
23 dichlorofluorescein, Methanol Cyclohexanol, 2-carboxy ethanol, 3-carboxypropanol, 4-
24 carboxybutanol, 2-hydroxyethanol, 3-hydroxypropanol, 4-hydroxybutanol, 2-aminoethanol, 2-
25 nitroethanol, 3-aminopropanol, 3-nitropropanol, 4-aminobutanol, and 4-nitrobutanol.

1 26.(previously presented) The method of claim 10, wherein the modified nucleotide is selected
2 from the group consisting of Adenosine-5'- (γ-ANS) triphosphate, Guanosine-5'- (γ-ANS)
3 triphosphate, Cytosine-5'- (γ-ANS) triphosphate, Thymidine-5'- (γ-ANS) triphosphate, Adenosine-
4 5'- (γ-4-nitrophenyl) triphosphate, Adenosine-5'- (γ-4-iodonaphthyl), Guanosine-5'- (γ-4-
5 nitrophenyl) triphosphate, triphosphate Adenosine-5'- (γ-6-methylnaphthyl) triphosphate, Cytosine-
6 5'- (γ-4-nitrophenyl) triphosphate, Thymidine-5'- (γ-4-nitrophenyl) triphosphate, Adenosine-5'- (γ-6-
7 methoxynaphthyl) triphosphate, Uracil-5'- (γ-4-nitrophenyl) triphosphate, 3'-azido-3'-
8 deoxythymidine-5'- (γ-4-nitrophenyl) triphosphate, Adenosine-5'- (γ-6-aminonaphthyl) triphosphate,
9 3'-azido-2', 3'-dideoxythymidine-5'- (γ-4- nitrophenyl) triphosphate, Adenosine-5'- (γ-6-
10 nitronaphthyl) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'- (γ-4-
11 nitrophenyl) triphosphate, Adenosine-5'- (γ-6-chloronaphthyl) triphosphate, Adenosine-5'- (γ-4-
12 aminophenyl) triphosphate, Adenosine-5'- (γ-6-bromonaphthyl) triphosphate, Adenosine-5'- (γ-4-
13 methylphenyl) triphosphate, Adenosine-5'- (γ-6-iodonaphthyl) triphosphate, Adenosine-5'- (γ-4-
14 methoxyphenyl) triphosphate, Adenosine-5'- (γ-4'-hydroxybiphenyl) triphosphate, Adenosine-5'- (γ-
15 4-chlorophenyl) triphosphate, Adenosine-5'- (γ-8-quinolyl) triphosphate, Adenosine-5'- (γ-4-
16 bromophenyl) triphosphate, Adenosine-5'- (γ-3-pyridyl) triphosphate, Adenosine-5'- (γ-
17 umbelliferone), Adenosine-5'- (γ-4-iodophenyl) triphosphate, Adenosine-5'- (γ-4-nitronaphthyl)
18 triphosphate, Adenosine-5'- (γ-resorufin) triphosphate, Adenosine-5'- (γ-pyrene) triphosphate,
19 Adenosine-5'- (γ-4-aminonaphthyl) triphosphate, Adenosine-5'- (γ-anthracene) triphosphate,
20 Adenosine-5'- (Γ-6-nitroanthracene) triphosphate, Adenosine-5'- (γ-4-methylnaphthyl) triphosphate,
21 Adenosine-5'- (γ-flavonyl) triphosphate, Adenosine-5'- (γ-4-methoxynaphthyl) triphosphate,
22 Adenosine-5'- (γ-fluorescein) triphosphate, Adenosine-5'- (γ-benzoflavone) triphosphate, Adenosine-
23 5'- (γ-4-chloronaphthyl) triphosphate, Adenosine-5'- (γ- (4-nitrophenyl)- γ'- (4-aminophenyl)
24 triphosphate, Adenosine-5'- (γ-4-bromonaphthyl) triphosphate, Adenosine-5'- (γ- (4-nitrophenyl)-
25 γ'- (4-nitronaphthyl) triphosphate, Adenosine-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-
26 acetoxypropyl) triphosphate, Guanosine-5'- (γ-methyl) triphosphate, Cytosine-5'- (γ-methyl)
27 triphosphate, Adenosine-5'- (γ-acetoxymethyl) triphosphate (CH₃0OCCH₂-O-NTP), Thymidine-5'-
28 (γ-methyl) triphosphate, Uracil-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-acetoxyethyl)
29 triphosphate, 3'-azido-3'-deoxythymidine-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-
30 acetoxypentyl) triphosphate, 3'-azido-2', 3'-dideoxythymidine-5'- (γ-methyl) triphosphate, Adenosine-
31 5'- (γ, acetoxypropyl) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'- (γ-methyl)

32 triphosphate, Adenosine-5'- (γ- acetoxyhexyl) triphosphate, Adenosine-5'- (γ-ethyl) triphosphate,
33 Adenosine-5'- (γ-2-nitroethyl) triphosphate, Adenosine-5'- (γ-propyl) triphosphate, Adenosine-5'-
34 (γ-4-butyl) triphosphate, Adenosine-5'- (γ-3-nitropropyl) triphosphate, Adenosine-5'- (γ-hexyl)
35 triphosphate, Adenosine-5'- (γ-octyl) triphosphate, Adenosine-5'- (γ-4-nitrobutyl)triphosphate,
36 Adenosine-5'- (γ-decyl) triphosphate, Adenosine-5'- (γ-dodecyl) triphosphate, Adenosine-5'- (γ-5-
37 nitropentyl)triphosphate, Adenosine-5'- (γ-isopropyl) triphosphate, Adenosine-5'- (γ-tert-butyl)
38 triphosphate, Adenosine-5'- (γ-methyl)- (γ'-ethyl) triphosphate, Adenosine-5'- (γ-cyclohexyl)
39 triphosphate, Adenosine-5'- (γ-methyl)- (γ'-propyl) triphosphate, Adenosine-5'- (γ-2-propenyl)
40 triphosphate, Adenosine-5'- (γ-3-butenyl) triphosphate, Guanosine-5'- (γ-2-propenyl) triphosphate,
41 Adenosine-5'- (γ-4-pentenyl) triphosphate, Cytosine-5'- (γ-2-propenyl) triphosphate, Adenosine-5'-
42 (γ-5-hexenyl) triphosphate, Thymidine-5'- (γ-2-propenyl) triphosphate, Adenosine-5'- (γ-
43 cyclohexenyl) triphosphate, Uracil-5'- (7-2-propenyl) triphosphate, Adenosine-5'- (γ-3-
44 propanaldehyde) triphosphate, 3'-azido-3'-deoxythymidine-5'- (γ-2-propenyl) triphosphate,
45 Adenosine-5'- (γ-4-butanaldehyde) triphosphate, 3'-azido-2',3'-dideoxythymidine-5'- (γ-2-propenyl)
46 triphosphate, Adenosine-5'- (γ-3-butanone) triphosphate, 2',3'-didehydro-2',3'-dideoxythymidine-5'-
47 (γ-2-propenyl) triphosphate, Adenosine-5'- (γ-2-propynyl) triphosphate, 3'-azido-2', 3'-
48 dideoxythymidine-5'- (γ-2-propynyl) triphosphate, Guanosine-5'- (γ-2-propynyl) triphosphate,
49 Cytosine-5'- (γ-2-propynyl) triphosphate, 2',3'-didehydro-2',3'-dideoxythymidine-5'- (γ-2-propynyl)
50 triphosphate Thymidine 5'- (γ-2-propynyl) triphosphate, Uracil-5'- (γ-2-propynyl) triphosphate,
51 Adenosine-5'- (γ-3-butynyl) triphosphate, 3'-azido-3'-deoxythymidine-5'- (γ-2-propynyl)
52 triphosphate, Adenosine-5'- (γ-4-pentynyl) triphosphate, Adenosine-5'- (γ-5-pentynyl) triphosphate,
53 Adenosine-5'- (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 acetoxyethyl naphthyl)
54 triphosphate, Guanosine-5'- (γ-4-phenyl) triphosphate, Cytosine-5'- (γ-4-phenyl) triphosphate,
55 Adenosine-5'- (γ- (4-methylpyridyl)triphosphate, Thymidine-5'- (γ-4-phenyl) triphosphate, Uracil-5'-
56 (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (5-methoxypyridyl)triphosphate, 3'-azido-3'-
57 deoxythymidine-5'- (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (5-nitropyridyl)triphosphate, 3'-
58 azido-2',3'-dideoxythymidine-5'- (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (5-
59 acetoxyethylpyridyl) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'- (γ-4-phenyl)
60 triphosphate, Adenosine-5'- (γ- (6-methyl-1-quinolyl) triphosphate, Adenosine-5'- (γ-4-
61 carboxyphenyl) triphosphate, Adenosine-5'- (γ-(6-methoxy-1-quinolyl)triphosphate, Adenosine-5'-
62 (γ- (4-acetoxyethyl) phenyl) triphosphate, Adenosine-5'- (γ- (4-methyl-1-quinolyl)triphosphate,

63 Adenosine-5'- (γ-4-nitrophenyl) triphosphate, Adenosine-5'- (γ-4-methylphenyl)triphosphate,
64 Adenosine-5'- (γ- (6-nitro-1-quinolyl) triphosphate, Adenosine-5'- (γ-4-methoxyphenyl)
65 triphosphate, Adenosine-5'- (γ- (4-acetoxymethylpyrenyl) triphosphate, Adenosine-5'- (γ-4-
66 ethylphenyl) triphosphate, Adenosine-5'- (γ- (6-methylpyrenyl) triphosphate, Adenosine-5'- (γ-4-
67 butylphenyl) triphosphate, Adenosine 5'- (γ-naphthyl) triphosphate, Adenosine-5'- (γ- (6-
68 ethylpyrenyl) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 methyl naphthyl)triphosphate, Adenosine-
69 5'- (γ- (6-nitropyrenyl) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 methoxynaphthyl) triphosphate,
70 Adenosine-5'- (γ-6- (carboxysuccinimidyl fluorescein) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8
71 nitro naphthyl) triphosphate. Adenosine-5'- (γ-6-carboxymethyl-2, 7-dichlorofluorescein)
72 triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 ethyl naphthyl) triphosphate, Adenosine-5'- (γ-4-phenyl)-
73 (γ'-4 nitrophenyl) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 butyl naphthyl)triphosphate,
74 Adenosine-5'- (γ-4-phenyl)- (γ'-4 aminophenyl)triphosphate, Adenosine-5'- (γ-methyl) triphosphate,
75 Adenosine-5'- (γ-3-aminopropyl) triphosphate, Guanosine-5'- (γ-methyl) triphosphate, Adenosine-5'-
76 (γ-4-aminobutyl) triphosphate, Cytosine-5'- (γ-methyl) triphosphate Adenosine-5'- (γ-cyclohexyl)
77 triphosphate, Thymidine-5'- (γ-methyl) triphosphate Adenosine-5'- (γ-2-carboxyethyl) triphosphate,
78 Uracil-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-3-carboxypropyl)triphosphate, 3'-azido-3'-
79 deoxythymidine-5'- (7-methyl) triphosphate, Adenosine-5'- (γ-4-carboxybutyl) triphosphate, 3'-
80 azido-2',3'-dideoxythymidine-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-2-hydroxyethyl)
81 triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'- (γ-methyl)triphosphate, Adenosine-5'- (γ-3-
82 hydroxypropyl) triphosphate, Adenosine-5'- (γ-ethyl) triphosphate, Adenosine-5'- (γ-propyl)
83 triphosphate, Adenosine-5'- (γ-4-hydroxybutyl) triphosphate, Adenosine-5'- (γ-4-butyl) triphosphate,
84 Adenosine-5'- (γ-2-nitroethyl) triphosphate, Adenosine-5'- (γ-hexyl) triphosphate, Adenosine-5'- (γ-
85 3-nitropropyl) triphosphate, Adenosine-5'- (γ-isopropyl) triphosphate, Adenosine-5'- (γ-4-nitrobutyl)
86 triphosphate, Adenosine-5'- (γ-tert-butyl) triphosphate ,Adenosine-5'- (γ-methyl)- (γ'-
87 ethyl)triphosphate, Adenosine-5'- (γ-cyclohexyl) triphosphate, Adenosine-5'- (γ-2-
88 aminoethyl)triphosphate, and Adenosine-5'- (γ-methyl)- (γ'-propyl) triphosphate.

1 27.(currently amended) The method of claim 13, wherein the tag ~~comprises a molecular tag~~
2 is covalently bonded to the modified nucleotide through a linker.

1 **28.(currently amended)** The method of claim 13, wherein the tag ~~comprises a molecular tag~~
2 is covalently bonded to the modified nucleotide.

1 **29.(previously presented)** The method of claim 13, wherein the modified nucleotide comprises
2 a β and/or γ phosphate modified nucleotide.

1 **30.(previously presented)** The method of claim 13, wherein the modified nucleotide comprises
2 a β phosphate modified nucleotide.

1 **31.(previously presented)** The method of claim 13, wherein the modified nucleotide comprises
2 a γ phosphate modified nucleotide.

1 **32.(canceled)** The method of claim 28, wherein the molecular tag comprises a fluorophore selected
2 from the group consisting of 4-acetamido-4'isothiocyanostilbene-2,2'disulfonic acid; acridine and
3 derivatives: acridine, acridine isothiocyanate; 5- (2'-aminoethyl) aminonaphthalene-1-sulfonic acid
4 (EDANS); 4-amino – 3-vinylsulfonyl) phenyl] naphthalimide-3,5 disulfonate; –(4-anilino-1naphthyl)
5 maleimide; anthranilamide; BODIPY; Brilliant Yellow; coumarin and derivatives: coumarin, 7-
6 amino-4-methylcoumarin (AMC, Coumarin 120), 7-amino-4trifluoromethylcouluarin (Coumaran
7 151); cyanine dyes; cyanosine; 4', 6-diaminidino-2phenylindole (DAPI); 5', 5"-dibromopyrogallol-
8 sulfonaphthalein (Bromopyrogallol Red); 7-diethylamino-3- (4'-isothiocyanatophenyl)-4-
9 methylcoumarin; diethylenetriamine pentaacetate; 4,4'-diisothiocyanatodihydro-stilbene-2,2'-
10 disulfonic acid; 4,4' diisothiocyanostilbene-2,2'-disulfonic acid; 5-dimethylamino naphthalene-1-
11 sulfonyl chloride (DNS, dansylchloride); 4-dimethylaminophenylazophenyl-4'-isothiocyanate
12 (DABITC); eosin and derivatives: eosin, eosin isothiocyanate, erythrosin and derivatives: erythrosin
13 B, erythrosin, isothiocyanate; ethidium; fluorescein and derivatives: 5carboxyfluorescein (FAM),
14 5- (4, 6-dichlorotriazin-2-yl) aminofluorescein (DTAF), 2', 7'dimethoxy-4'5'-dichloro-6-
15 carboxyfluorescein (JOE), fluorescein, fluorescein isothiocyanate, QFITC, (XRITC); fluorescamine;
16 IR144; IR1446; Malachite Green isothiocyanate; 4-methylumbelliferoneortho cresolphthalein;
17 nitrotyrosine; pararosaniline; Phenol Red; B-phycoerythrin; o-phthaldialdehyde; pyrene and
18 derivatives: pyrene, pyrene butyrate, succinimidyl 1-pyrene; butyrate quantum dots; Reactive Red
19 4 (CibacronTM Brilliant Red 3B-A) rhodamine and derivatives: 6-carboxy-X-rhodamine (ROX),

20 6carboxyrhodamine (R6G), lissamine rhodamine B sulfonyl chloride rhodamine (Rhod), rhodamine
21 B, rhodamine 123, rhodamine X isothiocyanate, sulforhodamine B, sulforhodamine 101, sulfonyl
22 chloride derivative of sulforhodamine 101 (Texas Red); N, N, N', N'-tetramethyl-6-
23 carboxyrhodamine (TAMRA); tetramethyl rhodamine; tetramethyl rhodamine isothiocyanate
24 (TRITC); riboflavin; rosolic acid; terbium chelate derivatives; Cy 3; Cy 5; Cy 5.5; Cy 7; IRD 700;
25 IRD 800; La Jolla Blue; phthalo cyanine; and naphthalo cyanine.

1 33.(canceled) The method of claim 27, wherein the linker is selected from the group consisting of
2 alkyl groups having between 1 and 30 carbon atoms, aryl groups having between about 6 and about
3 40 carbon atoms, or alkaryl and aralkyl groups having between about 7 and about 40 carbon atoms,
4 or mixture or combinations thereof, where the carbon atoms are replace by one or more hetero atoms
5 in the structure provided the structure represents a stable molecular system, where the hetero atoms
6 selected from the group consisting of P, S, Si, N, and O.

1 34.(canceled) The method of claim 28, wherein the molecular tag is selected from the group
2 consisting of 4-aminophenol, 6-aminonaphthol, 4-nitrophenol, 6-nitronaphthol, 4-methylphenol, 6-
3 chloronaphthol, 4-methoxyphenol, 6-bromonaphthol, 4-chlorophenol, 6-iodonaphthol, 4-
4 bromophenol, 4, 4'-dihydroxybiphenyl, 4-iodophenol, 8-hydroxyquinoline, 4-nitronaphthol, 3-
5 hydroxypyridine, 4-aminonaphthol, umbelliferone, 4-methylnaphthol, resorufin, 4-methoxynaphthol,
6 8-hydroxypyrene, 4-chloronaphthol, 9-hydroxyanthracene, 4-bromonaphthol, 6-nitro-9-
7 hydroxyanthracene, 4-iodonaphthol, 3-hydroxyflavone, 6-methylnaphthol, fluorescein, 6-
8 methoxynaphthol, 3-hydroxybenzoflavone, 1-hydroxy-2-propyne, 1-hydroxy-4-pentyne, 1-hydroxy-
9 3-butyne, 1-hydroxy-5-hexyne, Methanol, Ethanol, Propanol, Isopropanol, Butanol, Tert-butanol,
10 Hexanol, Cyclohexanol, Heptanol, Octanol, Decanol, Undecanol, Dodecanol, 1-acetoxyethanol
11 (CH₃OCCH₂-O-NTP), 2-acetoxyethanol, 3-acetoxypropanol, 4-acetoxybutanol, 5-acetoxypentanol,
12 6-acetoxyhexanol, 2-nitroethanol, 3-nitropropanol, 4-nitrobutanol, 5-nitropentanol, 5-nitrohexanol,
13 1-hydroxy-3-propene, 1-hydroxy-2-cyclohexene, 1-hydroxy-4-butene, 1-hydroxy-3-propaldehyde,
14 1-hydroxy-5-pentene, 1-hydroxy-4-butanaldehyde, 1-hydroxy-6-hexene, 1-hydroxy-3-Butanone,
15 Phenol, 4-methyl-3-hydroxypyridine, 4-Carboxyphenol, 5-methoxy-3-hydroxypyridine, 4-
16 Acetoxyethylphenol, 5-nitro-3-hydroxypyridine, 4-nitrophenol, 5-acetoxyethyl-3-
17 hydroxypyridine, 4-methylphenol, 6-methyl-8-hydroxyquinoline, 4-methoxyphenol 6-methoxy-8-

18 hydroxyquinoline, 4-ethylphenol, 4-methyl-8-hydroxyquinoline, 4-butylphenol, 6-nitro-8-
19 hydroxyquinoline, naphthol, 4-acetoxymethyl-8-hydroxyquinoline, 4 or 6 or 8 methylnaphthol
20 pyrene, 4 or 6 or 8 methoxynaphthol, 6-methyl-8-hydroxypyrene, 4 or 6 or 8 nitronaphthol, 6-ethyl-
21 8-hydroxypyrene, 4 or 6 or 8 ethylnaphthol, 6-nitro-8-hydroxypyrene, 4 or 6 or 8 butylnaphthol 6-
22 (carboxysuccinimidylester) fluorescein, 4 or 6 or 8 acetoxymethylnaphthol, 6-carboxymethyl-2, 7-
23 dichlorofluorescein, Methanol Cyclohexanol, 2-carboxy ethanol, 3-carboxypropanol, 4-
24 carboxybutanol, 2-hydroxyethanol, 3-hydroxypropanol, 4-hydroxybutanol, 2-aminoethanol, 2-
25 nitroethanol, 3-aminopropanol, 3-nitropropanol, 4-aminobutanol, and 4-nitrobutanol.

1 35.(previously presented) The method of claim 31, wherein the modified nucleotide is selected
2 from the group consisting of Adenosine-5'-(γ -ANS) triphosphate, Guanosine-5'-(γ -ANS)
3 triphosphate, Cytosine-5'-(γ -ANS) triphosphate, Thymidine-5'-(γ -ANS) triphosphate, Adenosine-
4 5'-(γ -4-nitrophenyl) triphosphate, Adenosine-5'-(γ -4-iodonaphthyl), Guanosine-5'-(γ -4-
5 nitrophenyl) triphosphate, triphosphate Adenosine-5'-(γ -6-methylnaphthyl) triphosphate, Cytosine-
6 5'-(γ -4-nitrophenyl) triphosphate, Thymidine-5'-(γ -4-nitrophenyl) triphosphate, Adenosine-5'-(γ -6-
7 methoxynaphthyl) triphosphate, Uracil-5'-(γ -4-nitrophenyl) triphosphate, 3'-azido-3'-
8 deoxythymidine-5'-(γ -4-nitrophenyl)triphosphate, Adenosine-5'-(γ -6-aminonaphthyl) triphosphate,
9 3'-azido-2', 3'-dideoxythymidine-5'-(γ -4- nitrophenyl)triphosphate, Adenosine-5'-(γ -6-
10 nitronaphthyl) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'-(γ -4-
11 nitrophenyl)triphosphate, Adenosine-5'-(γ -6-chloronaphthyl) triphosphate, Adenosine-5'-(γ -4-
12 aminophenyl) triphosphate, Adenosine-5'-(γ -6-bromonaphthyl) triphosphate, Adenosine-5'-(γ -4-
13 methylphenyl) triphosphate, Adenosine-5'-(γ -6-iodonaphthyl) triphosphate, Adenosine-5'-(γ -4-
14 methoxyphenyl) triphosphate, Adenosine-5'-(γ -4'-hydroxybiphenyl) triphosphate, Adenosine-5'-(γ -
15 4-chlorophenyl) triphosphate, Adenosine-5'-(γ -8-quinolyl) triphosphate, Adenosine-5'-(γ -4-
16 bromophenyl) triphosphate, Adenosine-5'-(γ -3-pyridyl) triphosphate, Adenosine-5'-(γ -
17 umbelliferone), Adenosine-5'-(γ -4-iodophenyl) triphosphate, Adenosine-5'-(γ -4-nitronaphthyl)
18 triphosphate, Adenosine-5'-(γ -resorufin) triphosphate, Adenosine-5'-(γ -pyrene) triphosphate,
19 Adenosine-5'-(γ -4-aminonaphthyl) triphosphate, Adenosine-5'-(γ -anthracene) triphosphate,
20 Adenosine-5'-(Γ -6-nitroanthracene) triphosphate, Adenosine-5'-(γ -4-methylnaphthyl) triphosphate,
21 Adenosine-5'-(γ -flavonyl) triphosphate, Adenosine-5'-(γ -4-methoxynaphthyl) triphosphate,
22 Adenosine-5'-(γ -fluorescein) triphosphate, Adenosine-5'-(γ -benzoflavone) triphosphate, Adenosine-

23 5'- (γ-4-chloronaphthyl) triphosphate, Adenosine-5'- (γ- (4-nitrophenyl)- γ'- (4-aminophenyl)
24 triphosphate, Adenosine-5'- (γ-4-bromonaphthyl) triphosphate, Adenosine-5'- (γ- (4-nitrophenyl)-
25 γ'- (4-nitronaphthyl) triphosphate, Adenosine-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-
26 acetoxypropyl)triposphate, Guanosine-5'- (γ-methyl) triphosphate, Cytosine-5'- (γ-methyl)
27 triphosphate, Adenosine-5'- (γ-acetoxymethyl)triposphate (CH₃OOCCH₂-O-NTP), Thymidine-5'-
28 (γ-methyl) triphosphate, Uracil-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-acetoxyethyl)
29 triphosphate, 3'-azido-3'-deoxythymidine-5-(γ-methyl)triposphate, Adenosine-5'- (γ-
30 acetoxybutyl)triposphate, 3'-azido-2',3'-dideoxythymidine-5'- (γ-methyl) triphosphate, Adenosine-
31 5'- (γ, acetoxypentyl) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'- (γ-methyl)
32 triphosphate, Adenosine-5'- (γ- acetoxyhexyl) triphosphate, Adenosine-5'- (γ-ethyl) triphosphate,
33 Adenosine-5'- (γ-2-nitroethyl) triphosphate, Adenosine-5'- (γ-propyl) triphosphate, Adenosine-5'-
34 (γ-4-butyl) triphosphate, Adenosine-5'- (γ-3-nitropropyl) triphosphate, Adenosine-5'- (γ-hexyl)
35 triphosphate, Adenosine-5'- (γ-octyl) triphosphate, Adenosine-5'- (γ-4-nitrobutyl)triposphate,
36 Adenosine-5'- (γ-decyl) triphosphate, Adenosine-5'- (γ-dodecyl) triphosphate, Adenosine-5'- (γ-5-
37 nitropentyl)triposphate, Adenosine-5'- (γ-isopropyl) triphosphate, Adenosine-5'- (γ-tert-butyl)
38 triphosphate, Adenosine-5'- (γ-methyl)- (γ'-ethyl) triphosphate, Adenosine-5'- (γ-cyclohexyl)
39 triphosphate, Adenosine-5'- (γ-methyl)- (γ'-propyl) triphosphate, Adenosine-5'- (γ-2-propenyl)
40 triphosphate, Adenosine-5'- (γ-3-butenyl) triphosphate, Guanosine-5'- (γ-2-propenyl) triphosphate,
41 Adenosine-5'- (γ-4-pentenyl) triphosphate, Cytosine-5'- (γ-2-propenyl) triphosphate, Adenosine-5'-
42 (γ-5-hexenyl) triphosphate, Thymidine-5'- (γ-2-propenyl) triphosphate, Adenosine-5'- (γ-
43 cyclohexenyl) triphosphate, Uracil-5'- (7-2-propenyl) triphosphate, Adenosine-5'- (γ-3-
44 propanaldehyde) triphosphate, 3'-azido-3'-deoxythymidine-5'- (γ-2-propenyl) triphosphate,
45 Adenosine-5'- (γ-4-butanaldehyde) triphosphate, 3'-azido-2',3'-dideoxythymidine-5'- (γ-2-propenyl)
46 triphosphate, Adenosine-5'- (γ-3-butanone) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'-
47 (γ-2-propenyl) triphosphate, Adenosine-5'- (γ-2-propynyl) triphosphate, 3'-azido-2', 3'-
48 dideoxythymidine-5'- (γ-2-propynyl) triphosphate, Guanosine-5'- (γ-2-propynyl) triphosphate,
49 Cytosine-5'- (γ-2-propynyl) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'- (γ-2-propynyl)
50 triphosphate Thymidine 5'- (γ-2-propynyl) triphosphate, Uracil-5'- (γ-2-propynyl) triphosphate,
51 Adenosine-5'- (γ-3-butynyl) triphosphate, 3'-azido-3'-deoxythymidine-5'- (γ-2-propynyl)
52 triphosphate, Adenosine-5'- (γ-4-pentynyl) triphosphate, Adenosine-5'- (γ-5-pentynyl) triphosphate,
53 Adenosine-5'- (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 acetoxymethyl naphthyl)

54 triphosphate, Guanosine-5'- (γ-4-phenyl) triphosphate, Cytosine-5'- (γ-4-phenyl) triphosphate,
55 Adenosine-5'- (γ- (4-methylpyridyl) triphosphate, Thymidine-5'- (γ-4-phenyl) triphosphate, Uracil-5'-
56 (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (5-methoxypyridyl) triphosphate, 3'-azido-3'-
57 deoxythymidine-5'- (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (5-nitropyridyl) triphosphate, 3'-
58 azido-2',3'-dideoxythymidine-5'- (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (5-
59 acetoxyethylpyridyl) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'- (γ-4-phenyl)
60 triphosphate, Adenosine-5'- (γ- (6-methyl-1-quinolyl) triphosphate, Adenosine-5'- (γ-4-
61 carboxyphenyl) triphosphate, Adenosine-5'- (γ- (6-methoxy-1-quinolyl) triphosphate, Adenosine-5'-
62 (γ- (4-acetoxyethyl) phenyl) triphosphate, Adenosine-5'- (γ- (4-methyl-1-quinolyl) triphosphate,
63 Adenosine-5'- (γ-4-nitrophenyl) triphosphate, Adenosine-5'- (γ-4-methylphenyl) triphosphate,
64 Adenosine-5'- (γ- (6-nitro-1-quinolyl) triphosphate, Adenosine-5'- (γ-4-methoxyphenyl)
65 triphosphate, Adenosine-5'- (γ- (4-acetoxyethylpyrenyl) triphosphate, Adenosine-5'- (γ-4-
66 ethylphenyl) triphosphate, Adenosine-5'- (γ- (6-methylpyrenyl) triphosphate, Adenosine-5'- (γ-4-
67 butylphenyl) triphosphate, Adenosine 5'- (γ-naphthyl) triphosphate, Adenosine-5'- (γ- (6-
68 ethylpyrenyl) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 methyl naphthyl) triphosphate, Adenosine-
69 5'- (γ- (6-nitropyrenyl) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 methoxynaphthyl) triphosphate,
70 Adenosine-5'- (γ-6- (carboxysuccinimidyl fluorescein) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8
71 nitro naphthyl) triphosphate. Adenosine-5'- (γ-6-carboxymethyl-2, 7-dichlorofluorescein)
72 triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 ethyl naphthyl) triphosphate, Adenosine-5'- (γ-4-phenyl)-
73 (γ'-4 nitrophenyl) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 butyl naphthyl) triphosphate,
74 Adenosine-5'- (γ-4-phenyl)- (γ'-4 aminophenyl) triphosphate, Adenosine-5'- (γ-methyl) triphosphate,
75 Adenosine-5'- (γ-3-aminopropyl) triphosphate, Guanosine-5'- (γ-methyl) triphosphate, Adenosine-5'-
76 (γ-4-aminobutyl) triphosphate, Cytosine-5'- (γ-methyl) triphosphate Adenosine-5'- (γ-cyclohexyl)
77 triphosphate, Thymidine-5'- (γ-methyl) triphosphate Adenosine-5'- (γ-2-carboxyethyl) triphosphate,
78 Uracil-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-3-carboxypropyl) triphosphate, 3'-azido-3'-
79 deoxythymidine-5'- (7-methyl) triphosphate, Adenosine-5'- (γ-4-carboxybutyl) triphosphate, 3'-
80 azido-2',3'-dideoxythymidine-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-2-hydroxyethyl)
81 triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-3-
82 hydroxypropyl) triphosphate, Adenosine-5'- (γ-ethyl) triphosphate, Adenosine-5'- (γ-propyl)
83 triphosphate, Adenosine-5'- (γ-4-hydroxybutyl) triphosphate, Adenosine-5'- (γ-4-butyl) triphosphate,
84 Adenosine-5'- (γ-2-nitroethyl) triphosphate, Adenosine-5'- (γ-hexyl) triphosphate, Adenosine-5'- (γ-

85 3-nitropropyl) triphosphate, Adenosine-5'-(γ -isopropyl) triphosphate, Adenosine-5'-(γ -4-nitrobutyl)
86 triphosphate, Adenosine-5'-(γ -tert-butyl) triphosphate, Adenosine-5'-(γ -methyl)-(γ '-
87 ethyl)triphosphate, Adenosine-5'-(γ -cyclohexyl) triphosphate, Adenosine-5'-(γ -2-
88 aminoethyl)triphosphate, and Adenosine-5'-(γ -methyl)-(γ '-propyl) triphosphate.

1 36.(previously presented) The method of claim 7, wherein the polymerizing agent is selected
2 from the group consisting of naturally occurring or synthetic polymerases and reverse transcriptases.

1 37.(previously presented) The method of claim 13, wherein the polymerizing agent is selected
2 from the group consisting of naturally occurring or synthetic polymerases and reverse transcriptases.

1 38.(currently amended) The kit of claim 15, wherein the tag ~~comprises a molecular tag is~~
2 covalently bonded to the modified nucleotide through a linker.

1 39.(currently amended) The kit of claim 15, wherein the tag ~~comprises a molecular tag is~~
2 covalently bonded to the modified nucleotide.

1 40.(previously presented) The kit of claim 15, wherein the modified nucleotide comprises a β
2 and/or γ phosphate modified nucleotide.

1 41.(previously presented) The kit of claim 15, wherein the modified nucleotide comprises a β
2 phosphate modified nucleotide.

1 42.(previously presented) The kit of claim 15, wherein the modified nucleotide comprises a γ
2 phosphate modified nucleotide.

1 43.(previously presented) The kit of claim 39, wherein the molecular tag comprises a
2 fluorophore selected from the group consisting of 4-acetamido-4'isothiocyanostilbene-
3 2,2'disulfonic acid; acridine and derivatives: acridine, acridine isothiocyanate; 5- (2'-aminoethyl)
4 aminonaphthalene-1-sulfonic acid (EDANS); 4-amino – 3-vinylsulfonyl) phenyl] naphthalimide-3,5
5 disulfonate; – (4-anilino-1naphthyl) maleimide; anthranilamide; BODIPY; Brilliant Yellow;

6 coumarin and derivatives: coumarin, 7-amino-4-methylcoumarin (AMC, Coumarin 120), 7-amino-
7 4trifluoromethylcouluarin (Coumaran 151); cyanine dyes; cyanosine; 4', 6-diaminidino-
8 2phenylindole (DAPI); 5', 5"-dibromopyrogallol-sulfonaphthalein (Bromopyrogallol Red); 7-
9 diethylamino-3-(4'-isothiocyanatophenyl)-4-methylcoumarin; diethylenetriamine pentaacetate; 4,4'-
10 diisothiocyanatodihydro-stilbene-2,2'-disulfonic acid; 4,4' diisothiocyanatostilbene-2,2'-disulfonic
11 acid; 5-dimethylamino naphthalene-1-sulfonyl chloride (DNS, dansylchloride); 4-
12 dimethylaminophenylazophenyl-4'-isothiocyanate (DABITC); eosin and derivatives: eosin, eosin
13 isothiocyanate, erythrosin and derivatives: erythrosin B, erythrosin, isothiocyanate; ethidium;
14 fluorescein and derivatives: 5carboxyfluorescein (FAM), 5- (4, 6-dichlorotriazin-2-yl)
15 aminofluorescein (DTAF), 2', 7'dimethoxy-4'5'-dichloro-6-carboxyfluorescein (JOE), fluorescein,
16 fluorescein isothiocyanate, QFITC, (XRITC); fluorescamine; IR144; IR1446; Malachite Green
17 isothiocyanate; 4-methylumbelliferoneortho cresolphthalein; nitrotyrosine; pararosaniline; Phenol
18 Red; B-phycoerythrin; o-phthaldialdehyde; pyrene and derivatives: pyrene, pyrene butyrate,
19 succinimidyl 1-pyrene; butyrate quantum dots; Reactive Red 4 (CibacronTM Brilliant Red 3B-A)
20 rhodamine and derivatives: 6-carboxy-X-rhodamine (ROX), 6carboxyrhodamine (R6G), lissamine
21 rhodamine B sulfonyl chloride rhodamine (Rhod), rhodamine B, rhodamine 123, rhodamine X
22 isothiocyanate, sulforhodamine B, sulforhodamine 101, sulfonyl chloride derivative of
23 sulforhodamine 101 (Texas Red); N, N, N', N'-tetramethyl-6-carboxyrhodamine (TAMRA);
24 tetramethyl rhodamine; tetramethyl rhodamine isothiocyanate (TRITC); riboflavin; rosolic acid;
25 terbium chelate derivatives; Cy 3; Cy 5; Cy 5.5; Cy 7; IRD 700; IRD 800; La Jolla Blue; phthalo
26 cyanine; and naphthalo cyanine.

1 **44.(previously presented)** The kit of claim 39, wherein the molecular tag is selected from the
2 group consisting of alkyl groups having between 1 and 30 carbon atoms, aryl groups having between
3 about 6 and about 40 carbon atoms, or alkaryl and aralkyl groups having between about 7 and about
4 40 carbon atoms, or mixture or combinations thereof, where the carbon atoms are replace by one or
5 more hetero atoms in the structure provided the structure represents a stable molecular system, where
6 the hetero atoms selected from the group consisting of P, S, Si, N, and O.

1 **45.(previously presented)** The kit of claim 39, wherein the molecular tag is selected from the
2 group consisting of 4-aminophenol, 6-aminonaphthol, 4-nitrophenol, 6-nitronaphthol, 4-

3 methylphenol, 6-chloronaphthol, 4-methoxyphenol, 6-bromonaphthol, 4-chlorophenol, 6-
4 iodonaphthol, 4-bromophenol, 4, 4'-dihydroxybiphenyl, 4-iodophenol, 8-hydroxyquinoline, 4-
5 nitronaphthol, 3-hydroxypyridine, 4-aminonaphthol, umbelliferone, 4-methylnaphthol, resorufin, 4-
6 methoxynaphthol, 8-hydroxypyrene, 4-chloronaphthol, 9-hydroxyanthracene, 4-bromonaphthol, 6-
7 nitro-9-hydroxyanthracene, 4-iodonaphthol, 3-hydroxyflavone, 6-methylnaphthol, fluorescein, 6-
8 methoxynaphthol, 3-hydroxybenzoflavone, 1-hydroxy-2-propyne, 1-hydroxy-4-pentyne, 1-hydroxy-
9 3-butyne, 1-hydroxy-5-hexyne, Methanol, Ethanol, Propanol, Isopropanol, Butanol, Tert-butanol,
10 Hexanol, Cyclohexanol, Heptanol, Octanol, Decanol, Undecanol, Dodecanol, 1-acetoxyethanol
11 (CH30OCCH2-O-NTP), 2-acetoxyethanol, 3-acetoxypropanol, 4-acetoxybutanol, 5-acetoxypentanol,
12 6-acetoxyhexanol, 2-nitroethanol, 3-nitropropanol, 4-nitrobutanol, 5-nitropentanol, 5-nitrohexanol,
13 1-hydroxy-3-propene, 1-hydroxy-2-cyclohexene, 1-hydroxy-4-butene, 1-hydroxy-3-propaldehyde,
14 1-hydroxy-5-pentene, 1-hydroxy-4-butanaldehyde, 1-hydroxy-6-hexene, 1-hydroxy-3-Butanone,
15 Phenol, 4-methyl-3-hydroxypyridine, 4-Carboxyphenol, 5-methoxy-3-hydroxypyridine, 4-
16 Acetoxyethylphenol, 5-nitro-3-hydroxypyridine, 4-nitrophenol, 5-acetoxyethyl-3-
17 hydroxypyridine, 4-methylphenol, 6-methyl-8-hydroxyquinoline, 4-methoxyphenol 6-methoxy-8-
18 hydroxyquinoline, 4-ethylphenol, 4-methyl-8-hydroxyquinoline, 4-butylphenol, 6-nitro-8-
19 hydroxyquinoline, naphthol, 4-acetoxyethyl-8-hydroxyquinoline, 4 or 6 or 8 methylnaphthol
20 pyrene, 4 or 6 or 8 methoxynaphthol, 6-methyl-8-hydroxypyrene, 4 or 6 or 8 nitronaphthol, 6-ethyl-
21 8-hydroxypyrene, 4 or 6 or 8 ethylnaphthol, 6-nitro-8-hydroxypyrene, 4 or 6 or 8 butylnaphthol 6-
22 (carboxysuccinimidylester) fluorescein, 4 or 6 or 8 acetoxyethylnaphthol, 6-carboxymethyl-2, 7-
23 dichlorofluorescein, Methanol Cyclohexanol, 2-carboxy ethanol, 3-carboxypropanol, 4-
24 carboxybutanol, 2-hydroxyethanol, 3-hydroxypropanol, 4-hydroxybutanol, 2-aminoethanol, 2-
25 nitroethanol, 3-aminopropanol, 3-nitropropanol, 4-aminobutanol, and 4-nitrobutanol.

1 46.(previously presented) The kit of claim 42, wherein the modified nucleotide is selected from
2 the group consisting of Adenosine-5'- (γ-ANS) triphosphate, Guanosine-5'- (γ-ANS) triphosphate,
3 Cytosine-5'- (γ-ANS) triphosphate, Thymidine-5'- (γ-ANS) triphosphate, Adenosine-5'- (γ-4-
4 nitrophenyl) triphosphate, Adenosine-5'- (γ-4-iodonaphthyl), Guanosine-5'- (γ-4-nitrophenyl)
5 triphosphate, triphosphate Adenosine-5'- (γ-6-methylnaphthyl) triphosphate, Cytosine-5'- (γ-4-
6 nitrophenyl) triphosphate, Thymidine-5'- (γ-4-nitrophenyl) triphosphate, Adenosine-5'- (γ-6-
7 methoxynaphthyl) triphosphate, Uracil-5'- (γ-4-nitrophenyl) triphosphate, 3'-azido-3'-

8 deoxythymidine-5'-(γ -4-nitrophenyl)triphosphate, Adenosine-5'-(γ -6-aminonaphthyl) triphosphate,
9 3'-azido-2', 3'-dideoxythymidine-5'-(γ -4-nitrophenyl)triphosphate, Adenosine-5'-(γ -6-
10 nitronaphthyl) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'-(γ -4-
11 nitrophenyl)triphosphate, Adenosine-5'-(γ -6-chloronaphthyl) triphosphate, Adenosine-5'-(γ -4-
12 aminophenyl) triphosphate, Adenosine-5'-(γ -6-bromonaphthyl) triphosphate, Adenosine-5'-(γ -4-
13 methylphenyl) triphosphate, Adenosine-5'-(γ -6-iodonaphthyl) triphosphate, Adenosine-5'-(γ -4-
14 methoxyphenyl) triphosphate, Adenosine-5'-(γ -4'-hydroxybiphenyl) triphosphate, Adenosine-5'-(γ -
15 4-chlorophenyl) triphosphate, Adenosine-5'-(γ -8-quinolyl) triphosphate, Adenosine-5'-(γ -4-
16 bromophenyl) triphosphate, Adenosine-5'-(γ -3-pyridyl) triphosphate, Adenosine-5'-(γ -
17 umbelliferone), Adenosine-5'-(γ -4-iodophenyl) triphosphate, Adenosine-5'-(γ -4-nitronaphthyl)
18 triphosphate, Adenosine-5'-(γ -resorufin) triphosphate, Adenosine-5'-(γ -pyrene) triphosphate,
19 Adenosine-5'-(γ -4-aminonaphthyl) triphosphate, Adenosine-5'-(γ -anthracene) triphosphate,
20 Adenosine-5'-(Γ -6-nitroanthracene) triphosphate, Adenosine-5'-(γ -4-methylnaphthyl) triphosphate,
21 Adenosine-5'-(γ -flavonyl) triphosphate, Adenosine-5'-(γ -4-methoxynaphthyl) triphosphate,
22 Adenosine-5'-(γ -fluorescein) triphosphate, Adenosine-5'-(γ -benzoflavone) triphosphate, Adenosine-
23 5'-(γ -4-chloronaphthyl) triphosphate, Adenosine-5'-(γ -(4-nitrophenyl)- γ' -(4-aminophenyl)
24 triphosphate, Adenosine-5'-(γ -4-bromonaphthyl) triphosphate, Adenosine-5'-(γ -(4-nitrophenyl)- γ' -(4-
25 nitronaphthyl) triphosphate, Adenosine-5'-(γ -methyl) triphosphate, Adenosine-5'-(γ -
26 acetoxypropyl)triphosphate, Guanosine-5'-(γ -methyl) triphosphate, Cytosine-5'-(γ -methyl)
27 triphosphate, Adenosine-5'-(γ -acetoxyethyl)triphosphate (CH₃0OCCH₂-O-NTP), Thymidine-5'-
28 (γ -methyl) triphosphate, Uracil-5'-(γ -methyl) triphosphate, Adenosine-5'-(γ -acetoxyethyl)
29 triphosphate, 3'-azido-3'-deoxythymidine-5'-(γ -methyl)triphosphate, Adenosine-5'-(γ -
30 acetoxybutyl)triphosphate, 3'-azido-2', 3'-dideoxythymidine-5'-(γ -methyl)triphosphate, Adenosine-
31 5'-(γ , acetoxypropyl) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'-(γ -methyl)
32 triphosphate, Adenosine-5'-(γ - acetoxyhexyl) triphosphate, Adenosine-5'-(γ -ethyl) triphosphate,
33 Adenosine-5'-(γ -2-nitroethyl) triphosphate, Adenosine-5'-(γ -propyl) triphosphate, Adenosine-5'-(γ -
34 4-butyl) triphosphate, Adenosine-5'-(γ -3-nitropropyl) triphosphate, Adenosine-5'-(γ -hexyl)
35 triphosphate, Adenosine-5'-(γ -octyl) triphosphate, Adenosine-5'-(γ -4-nitrobutyl)triphosphate,
36 Adenosine-5'-(γ -decyl) triphosphate, Adenosine-5'-(γ -dodecyl) triphosphate, Adenosine-5'-(γ -5-
37 nitropentyl)triphosphate, Adenosine-5'-(γ -isopropyl) triphosphate, Adenosine-5'-(γ -tert-butyl)
38 triphosphate, Adenosine-5'-(γ -methyl)-(γ' -ethyl) triphosphate, Adenosine-5'-(γ -cyclohexyl)

39 triphosphate, Adenosine-5'- (γ-methyl)- (γ'-propyl) triphosphate, Adenosine-5'- (γ-2-propenyl)
40 triphosphate, Adenosine-5'- (γ-3-but enyl) triphosphate, Guanosine-5'- (γ-2-propenyl) triphosphate,
41 Adenosine-5'- (γ-4-pentenyl) triphosphate, Cytosine-5'- (γ-2-propenyl) triphosphate, Adenosine-5'-
42 (γ-5-hexenyl) triphosphate, Thymidine-5'- (γ-2-propenyl) triphosphate, Adenosine-5'- (γ-
43 cyclohexenyl) triphosphate, Uracil-5'- (7-2-propenyl) triphosphate, Adenosine-5'- (γ-3-
44 propanaldehyde) triphosphate, 3'-azido-3'-deoxythymidine-5'- (γ-2-propenyl) triphosphate,
45 Adenosine-5'- (γ-4-butanaldehyde) triphosphate, 3'-azido-2',3'-dideoxythymidine-5'- (γ-2-propenyl)
46 triphosphate, Adenosine-5'- (γ-3-butanone) triphosphate, 2',3'-didehydro-2',3'-dideoxythymidine-5'-
47 (γ-2-propenyl) triphosphate, Adenosine-5'- (γ-2-propynyl) triphosphate, 3'-azido-2', 3'-
48 dideoxythymidine-5'- (γ-2-propynyl) triphosphate, Guanosine-5'- (γ-2-propynyl) triphosphate,
49 Cytosine-5'- (γ-2-propynyl) triphosphate, 2',3'-didehydro-2',3'-dideoxythymidine-5'- (γ-2-propynyl)
50 triphosphate Thymidine 5'- (γ-2-propynyl) triphosphate, Uracil-5'- (γ-2-propynyl) triphosphate,
51 Adenosine-5'- (γ-3-butynyl) triphosphate, 3'-azido-3'-deoxythymidine-5'- (γ-2-propynyl)
52 triphosphate, Adenosine-5'- (γ-4-pentynyl) triphosphate, Adenosine-5'- (γ-5-pentynyl) triphosphate,
53 Adenosine-5'- (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 acetoxy methyl naphthyl)
54 triphosphate, Guanosine-5'- (γ-4-phenyl) triphosphate, Cytosine-5'- (γ-4-phenyl) triphosphate,
55 Adenosine-5'- (γ- (4-methylpyridyl) triphosphate, Thymidine-5'- (γ-4-phenyl) triphosphate, Uracil-5'-
56 (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (5-methoxy pyridyl) triphosphate, 3'-azido-3'-
57 dideoxythymidine-5'- (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (5-nitro pyridyl) triphosphate, 3'-
58 azido-2',3'-dideoxythymidine-5'- (γ-4-phenyl) triphosphate, Adenosine-5'- (γ- (5-
59 acetoxy methyl pyridyl) triphosphate, 2', 3'-didehydro-2', 3'-dideoxythymidine-5'- (γ-4-phenyl)
60 triphosphate, Adenosine-5'- (γ- (6-methyl-1-quinolyl) triphosphate, Adenosine-5'- (γ-4-
61 carboxyphenyl) triphosphate, Adenosine-5'- (γ- (6-methoxy-1-quinolyl) triphosphate, Adenosine-5'-
62 (γ- (4-acetoxy methyl) phenyl) triphosphate, Adenosine-5'- (γ- (4-methyl-1-quinolyl) triphosphate,
63 Adenosine-5'- (γ-4-nitrophenyl) triphosphate, Adenosine-5'- (γ-4-methylphenyl) triphosphate,
64 Adenosine-5'- (γ- (6-nitro-1-quinolyl) triphosphate, Adenosine-5'- (γ-4-methoxyphenyl)
65 triphosphate, Adenosine-5'- (γ- (4-acetoxy methyl pyrenyl) triphosphate, Adenosine-5'- (γ-4-
66 ethylphenyl) triphosphate, Adenosine-5'- (γ- (6-methylpyrenyl) triphosphate, Adenosine-5'- (γ-4-
67 butylphenyl) triphosphate, Adenosine 5'- (γ-naphthyl) triphosphate, Adenosine-5'- (γ- (6-
68 ethylpyrenyl) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 methyl naphthyl) triphosphate, Adenosine-
69 5'- (γ- (6-nitro pyrenyl) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 methoxy naphthyl) triphosphate,

70 Adenosine-5'- (γ-6- (carboxysuccinimidyl fluorescein) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8
71 nitro naphthyl) triphosphate. Adenosine-5'- (γ-6-carboxymethyl-2, 7-dichlorofluorescein)
72 triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 ethyl naphthyl) triphosphate, Adenosine-5'- (γ-4-phenyl)-
73 (γ'-4 nitrophenyl) triphosphate, Adenosine-5'- (γ- (4 or 6 or 8 butyl naphthyl) triphosphate,
74 Adenosine-5'- (γ-4-phenyl)- (γ'-4 aminophenyl) triphosphate, Adenosine-5'- (γ-methyl) triphosphate,
75 Adenosine-5'- (γ-3-aminopropyl) triphosphate, Guanosine-5'- (γ-methyl) triphosphate, Adenosine-5'-
76 (γ-4-aminobutyl) triphosphate, Cytosine-5'- (γ-methyl) triphosphate Adenosine-5'- (γ-cyclohexyl)
77 triphosphate, Thymidine-5'- (γ-methyl) triphosphate Adenosine-5'- (γ-2-carboxyethyl) triphosphate,
78 Uracil-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-3-carboxypropyl) triphosphate, 3'-azido-3'-
79 deoxythymidine-5'- (7-methyl) triphosphate, Adenosine-5'- (γ-4-carboxybutyl) triphosphate, 3'-
80 azido-2',3'-dideoxythymidine-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-2-hydroxyethyl)
81 triphosphate, 2',3'-didehydro-2',3'-dideoxythymidine-5'- (γ-methyl) triphosphate, Adenosine-5'- (γ-3-
82 hydroxypropyl) triphosphate, Adenosine-5'- (γ-ethyl) triphosphate, Adenosine-5'- (γ-propyl)
83 triphosphate, Adenosine-5'- (γ-4-hydroxybutyl) triphosphate, Adenosine-5'- (γ-4-butyl) triphosphate,
84 Adenosine-5'- (γ-2-nitroethyl) triphosphate, Adenosine-5'- (γ-hexyl) triphosphate, Adenosine-5'- (γ-
85 3-nitropropyl) triphosphate, Adenosine-5'- (γ-isopropyl) triphosphate, Adenosine-5'- (γ-4-nitrobutyl)
86 triphosphate, Adenosine-5'- (γ-tert-butyl) triphosphate, Adenosine-5'- (γ-methyl)- (γ'-
87 ethyl) triphosphate, Adenosine-5'- (γ-cyclohexyl) triphosphate, Adenosine-5'- (γ-2-
88 aminoethyl) triphosphate, and Adenosine-5'- (γ-methyl)- (γ'-propyl) triphosphate.

1 47.(previously presented) The kit of claim 15, wherein the polymerizing agent is selected from
2 the group consisting of naturally occurring or synthetic polymerases and reverse transcriptases.